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- (71) Applicant: **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 5621 BA Eindhoven (NL).
- (72) Inventor: **ADLER, Glenn, J.**; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).
- (74) Agent: **GROENENDAAL, Antonius, W., M.**; International Octrooibureau B.V., Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).
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(54) Title: DISPLAY DEVICE

(57) Abstract: A display monitor (102) has at least a stand-alone operational mode, and a further operational mode as a further peripheral to, e.g., a PC (104). The monitor (102) has an input (108) for connecting to a first peripheral device (106). The monitor (102) also has circuitry (114) for enabling data communication with the first peripheral device (106) for user control of a functionality of the display monitor (102) in the stand-alone mode, and for data communication between the first peripheral (106) and the PC (104) via the monitor (102) when the monitor (102) is in the further operational mode and connected to the PC (104) and to the first peripheral (106).

Display device

The invention relates to a display device.

A Personal Computer (PC) Peripheral is generally plugged directly into the PC
5 via an interface connector. Most commonly today, that connector is becoming the USB
(Universal Serial Bus) connector, increasingly more replacing, e.g., IDE, RS232, and other
interfaces. A display device (like a monitor or other type of display) is normally connected
as a slave to the PC (or a Set Top Box), which acts as a host device. The monitor can not
operate in a stand-alone mode or use directly any of the PC-peripherals without involving the
10 host device.

It is an object of the invention to provide a monitor which can operate in the
slave mode as well as in the stand-alone mode. The invention is defined by the independent
claims. The dependent claims define advantageous embodiments. It is advantageous if a PC-
15 peripheral (i.e. any input or output device which can be used to control, input data to, or
output data from a PC) can also be used by the display device in the stand-alone mode. In this
case the peripheral is connected directly to the display device via a wire or wirelessly. Data
from that peripheral are used for the stand-alone function(s) contained in the display device.
For instance, a mouse can be used to control parameters related to the set-up of the display.
20 This function occurs without intervention of the PC. Therefore, the display device has the
circuitry and software onboard itself in order to interpret the data directly received from the
peripheral. During the time interval wherein the display device is utilizing the data from the
peripheral in question, this data is not passed on to the host device. Furthermore, when the
display device is switched to "slave" mode, (e.g., into a mode wherein it serves as a monitor
25 for a PC), the data from the peripheral is passed through to the host. This can be achieved
either via a wire or wirelessly. The data is presented and processed in a manner consistent
with industry standard peripherals and which the host can interpret in the same way in which
it would handle a peripheral connected directly to itself.

For completeness, monitors used on the MacIntosh currently allow peripherals to be plugged into the monitor. However, these peripherals use a USB hub in the monitor. The hub is simply a repeater function. The monitor itself, however, does not use directly this data from the peripherals for a stand-alone functionality.

5 The re-use according to the invention of a peripheral for multiple functionalities saves cost, desk space and wiring complexity in comparison with the case wherein two or more different peripherals are to be used. In addition, connecting the peripherals to the monitor provides a more convenient and overseeable way to the user of physically configuring the PC or Set Top Box system. Moreover, the display device
10 according to the invention can be used as an independent appliance, in addition to its conventionally being used as a slave to a PC or to another data processing system to which it is hooked up.

 These and other aspects of the invention will be apparent from and elucidated
15 with reference to the accompanying drawing, wherein the sole Figure 1 is a block diagram of a system incorporating the invention.

 System 100 comprises a display monitor 102, a PC 104 and a peripheral device 106. Monitor 102 has a connection 108 for connecting with peripheral device 106, and
20 a connection 110 for connection to PC 104. Monitor 102 has multiple operational modes. In a first mode, monitor 102 operates as a peripheral to PC 104. For example, monitor 102 serves as an output device to PC 104 when monitor 102 has been set into the first operational mode. In a second operational mode, monitor 102 operates as a stand-alone device, i.e., independent of PC 104. For example, monitor 102 comprises a sub-system 112 for enabling the rendering
25 of a digital image stored on, e.g., a removable solid state memory. As another example, sub-system 112 comprises a wireless modem and data processing capabilities to enable wireless data communication between the stand-alone monitor and an external data source. In the latter example, the data processing capabilities allow, e.g., to receive compressed video data and decompress and render the data locally at monitor 102.

30 Monitor 102 further comprises a mode switching circuit 114. Circuit 114 determines in which of the modes monitor 102 is being used. For example, circuit 114 detects whether or not monitor 102 is physically (wired or wireless) connected to PC 104. When monitor 102 is connected to PC 104 via connection 110, circuit 114 determines that monitor 102 itself is being used as a peripheral, in this case to PC 104. When monitor 102 is

disconnected from PC 104, circuit 114 enables to determine that monitor 102 is being used as a stand-alone appliance. For, e.g., a VGA connection, the presence or absence of a PC is detectable in a simple way. The PC provides +5V on one of the VGA connector pins. If the PC is powered, +5V is present. However, there may be other states where the PC is present
5 and the monitor is still operational in a stand alone mode (for instance when the PC is sleeping). Alternatively, circuit 114 comprises a simple switch to be flipped by the user in order to set monitor 102 to the proper operational mode, independently of an automatic detection of the presence or absence of a functional connection to PC 104.

Peripheral device 106 enables user interaction with PC 104, e.g., in a
10 conventional scenario, via monitor 102 in the first operational mode as if peripheral device 106 were directly connected to PC 104. Device 106 enables user interaction with monitor 102 directly in the second operational mode, e.g., to run a slide show or to control the processing capabilities local to monitor 102, independently of PC 104. Peripheral device 106 comprises, e.g., a user input device such as a mouse or a keyboard for data entry to PC 104 via monitor
15 102, or a card reader, a CD-ROM or a CD-R/W, in the first operational mode of monitor 102, and for user interaction to sub-system 112 of monitor 102 in the second operational mode of monitor 102.

Different data communication protocols may be used for communication between peripheral device 106 and monitor 102 on the one hand, and for communication
20 between monitor 102 and PC 104 on the other hand. For example, monitor 102 is coupled to PC 104 via USB, and peripheral device 106 is connected to a PS/2 on monitor 102. In the peripheral mode of monitor 102, i.e., monitor 102 serves as a peripheral to PC 104, circuit 114 of monitor 102 maps the PS/2 peripheral 106 to a USB peripheral for proper communication with PC 104. More than one peripheral 106 and/or more than one subsystem
25 112 can be present.

The non-prepublished application WO-A-02/23885 (attorney docket
US 000231) shows a stand-alone monitor as photograph slide show projector. This document relates to a stand-alone monitor for viewing high-resolution digital images without the need of a PC including a means for transferring digital images directly to the stand-alone monitor;
30 a means for displaying the digital images on a display screen of the stand-alone monitor; and a means for controlling the transfer and display of the digital images on the display screen. In one embodiment the images are received from a wireless image source, such as a digital camera. In another embodiment the images are read from an electronic storage media, such as smart media. The viewing of images on the monitor is controlled by a user, via a keypad

or remote control, for instance. The keypad and reader/receiver may be integrated directly into the monitor or implemented as an interface within a separate enclosure.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative
5 embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed in a claim. The word "a" or "an" preceding an element does not exclude the presence of a
10 plurality of such elements. The invention can be implemented by means of hardware comprising several distinct elements, and by means of a suitably programmed computer. In the device claim enumerating several means, several of these means can be embodied by one and the same item of hardware. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

CLAIMS:

1. A display device (102) having:
 - at least a stand-alone operational mode; and
 - 5 - a further operational mode as a further peripheral to a data processing system (104);the device (102) comprising:
 - an input (108) for connecting to a first peripheral device (106); and
 - circuitry (114) for enabling data communication with the first peripheral device for user control of a functionality of the display device (102) in the stand-alone mode, and for data
 - 10 communication between the first peripheral (106) and the data processing system (104) via the device (102) when the device (102) is in the further operational mode and connected to the system (104) and to the first peripheral (106).
2. The device (102) of claim 1, comprising further circuitry for setting the device
- 15 (102) into the stand-alone operational mode or into the further operational mode.
3. The device (102) of claim 2, wherein the further circuitry is operative to automatically set the device (102) mode when detecting that the device (102) is connected to the data processing system (104).
- 20 4. The device (102) of claim 1, comprising a subsystem (112) for storing data to be rendered on the monitor in the stand-alone mode under user control of the first peripheral.
- 25 5. The device (102) of claim 1, comprising conversion circuitry for converting first data of a first format being communicated from the first peripheral device (106) to the device (102) into a second format for data communication with the data processing system (104) in the further operational mode.

